

Remarks/Arguments

Claims 1-25 remain in this application. To more correctly describe phenomenon of bright edges caused by fringing electrical fields having undesirable orthogonal field components, applicants have substituted the term "disclination" for declination in the specification. Applicants have added no new matter to the specification.

Before proceeding to address the rejection, applicants will briefly summarize their invention to better assist the examiner in appreciating the difference between applicants' invention and the art of record. Applicants' invention, as recited in pending claims 1-25, concerns a technique for reducing sparkle artifacts in a LCOS imager. Such artifacts are attributable to adjacent less bright pixels with unequal brightness, resulting in fringing electrical fields that have a component orthogonal to the desired field. The sparkle problem is time invariant and is unrelated to motion in the image. To overcome the sparkle problem, applicants modify the video signal to be displayed by decomposing the luminance signal of a picture twice into a higher brightness level signal and a lower brightness level signal. The lower brightness level signal is low pass filtered after the first decomposing to reduce the difference in brightness levels between adjacent pixels. The higher brightness level signal is delayed in time to match the processing delay through the low pass filter. The delay matched higher brightness level signal and the low pass filtered lower brightness level signal are then combined to form an intermediate luminance signal. The intermediate luminance signal is decomposed into a higher brightness level signal and a lower brightness level signal. The demarcation between higher and lower brightness levels is also adjustable and also preferably related to the transition between the lower and higher gain portions of the gamma table. The lower brightness level signal is slew rate limited after the second decomposing to limit the difference in brightness levels between adjacent pixels. The higher brightness level signal is delayed in time to match the processing delay through the slew rate limiter. The delay matched higher brightness level signal and the slew rate limited lower brightness level signal are then combined to form a modified output luminance signal.

The subject matter of the instant application (sparkle reduction) is related to applicants' co-pending applications Serial No. 09/803,248 and 09/803,485, which are currently under rejection by the United States Patent and Trademark Office. Accompanying this application is a Supplemental Information Disclosure Statement that lists art cited in each of the other applications.

35 U.S.C. 103(a) Rejection of Claims 1-25

The examiner has rejected claims 1-25 under 35 U.S.C. 103(a) as obvious over U.S. Patent 6,359,663, issued March 19, 2002, in the name of Koen Gadeyne et al., from an application filed December 14, 1999 (hereinafter, "the Gadeyne et al. patent"), in view of U.S. Patent 6,219,101, issued in the name of Mehil H. Sani et al., issued August 17, 2001, from an application filed May 15, 1998 (hereinafter, "the Sani et al. patent.") Applicants respectfully traverse this rejection.

The Gadeyne et al. patent concerns a technique for addressing the problem of luminance response time differences between CRT and LCD displays. Such a luminance response to time difference will result in luminance jumps in a displayed picture before and after movement of the image. In other words, Gadeyne et al. are concerned with the transition from different brightness levels (darker-to-lighter and lighter-to-darker) from **picture-to-picture**. To overcome this problem, Gadeyne et al. convert an incoming (first) video signal into a second video signal modified to have different luminance response times for display on a different type of display device such as a LCD type display. The conversion causes the luminance time response of a picture element of the image, resulting from a change of the first video signal from a first amplitude value to a second amplitude value, to be substantially equal in shape and amplitude but reversed (i.e., inverted) in slope, as compared to the luminance time response of the same or another picture element of the image resulting from a change of the first video signal from the second amplitude value to the first amplitude value. The luminance time responses can be made substantially equal to predefined luminance time responses.

The Gadeyne et al. patent concerns a solution to a problem completely different than the problem overcome by applicants' claimed invention. As discussed above, the Gadeyne et al. patent provides a technique for removing luminance jumps that result from image movement. In contrast, applicants' claimed technique serves to reduce the problem of sparkle artifacts, a problem that remains time invariant, and in fact has no bearing on the luminance response time.

Applicants take issue with the examiners assertion that the Gadeyne et al. patent teaches every feature of applicants claims with the exception of a low pass filter for low pass filtering the lower brightness level signal. Processing an incoming video signal to yield a second signal having the same amplitude and shape but an inverted slope, as taught by Gadeyne et al. will presumably adjust the luminance response time and thus reduce the problem of flicker.

However, there is no disclosure in Gadeyne et al that such processing will reduce the incidence of sparkle, i.e., the problem of dark pixels appearing too bright in the same image.

A careful review of the disclosure of Gadeyne et al. reveals that this cited reference simply fails to recite the feature of slew rate limiting a second lower brightness level signal component of the video signal recited in applicants' independent claims 1, 12, and 19, and the claims that depend therefrom. At best, the Gadeyne et al. patent teaches the desirability of converting the incoming video signal into a second video signal so that the faster luminance response of a picture element to a change of the first video signal is slowed down in order to match the luminance response in time and amplitude to the known slower luminance response of the same or another picture element for the opposite change of the first video signal. As described at Col. 8, lines 62-67 and Col. 9, lines 1-22 of Gadeyne et al., the process of changing the luminance response time is an iterative process and involves subtracting a predicted luminance value from the actual value to yield a value Δ whose value determines whether the luminance should increase in the next period and by how much.

The process described in the Gadeyne et al. patent for changing the luminance value does not yield a low-pass filtered lower brightness level signal, nor does such a process yield a second lower brightness level signal that is slew rate limited. The examiner should appreciate that the iterative process by which Gadeyne et al. changes luminance from picture to picture does not constitute slew rate limiting which is a process for limiting the maximum rate of change of the brightness signal component for a step change input for a given picture. There simply is no disclosure or suggestion in the Gadeyne et al. patent of slew rate limiting the luminance signal as recited in applicants' claims.

The Sani et al. patent concerns a VGA to analog video converter that has flicker filter to eliminate flicker in the luminance component. The filter accepts signals in a YbCbCr format and eliminates flicker by averaging the pixels. The flicker filter of Sani et al. includes a pair of line storage memories (50, 52) for holding odd and even scan lines, respectively. The outputs of the line storage memories are scaled by one of multipliers (56, 58 and 60) before being summed by a summer (66).

In rejecting claims 1-25 under 35 U.S.C. 103(a), the examiner contends that Gadeyne et al. teaches all of the features of applicants' claims except low pass filtering which is taught by Sani et al. Applicants respectfully traverse this rejection.

As discussed above, the Gadeyne et al. patent fails to disclose or in anyway suggest the feature of slew-rate limiting a second lower brightness level signal component of the video signal as recited in applicants' claims. Likewise, the Sani et al. patent fails to teach this feature as well.

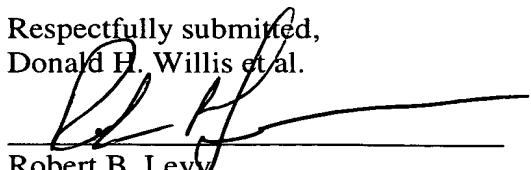
For this reason alone, applicants' claims 1-25 are non-obvious in view of, and patentable over, the art of record.

Applicants' claims are patentable for another reason as well. None of the art of record discloses applicants' feature of low-pass filtering the second lower brightness level signal component. The examiner readily submits that that Gadeyne et al. does not teach this feature, but suggests that Sani et al. teaches low pass filtering. However, a careful review of the Sani et al. patent reveals the examiner's reliance on this reference is misplaced. As discussed previously, the flicker filter of Sani et al. utilizes three multipliers (56, 58 and 60) to multiply the outputs of the line storage members, to eliminate flickering by averaging the pixel values. Averaging the pixel values, as taught by Sani et al. does not constitute low-pass filtering, a process that permits frequencies below a certain value to pass while rejecting those above such a value. Pixel averaging, as taught by Sani et al. will not reject pixel values above a certain threshold, as accomplished by applicants' low pass filtering. Therefore, combining the Gadeyne et al. and Sanin et al. patents, as suggested by the examiner, would not yield all of the features of applicants' claims. Accordingly, applicants' claims are non-obvious in view of and patentable over the art of record and withdrawal of the 35 U.S.C. 103(a) rejection of the claims is requested.

Conclusion

Based on the foregoing remarks, applicants deem this application in condition for allowance and solicit such action. If, however, the Examiner is of the opinion that such action cannot be taken, the Examiner is invited to contact the applicant's attorney at (609) 734-6820, so that a mutually convenient date and time for a telephonic interview may be scheduled. No fee is believed due. However, if a fee is due, please charge the additional fee to Deposit Account 07-0832.

Respectfully submitted,
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